

## **ATTACHMENT FOR A PLOW**

### **FIELD OF THE INVENTION**

The present invention is generally directed to plows, and is more particularly directed at  
5 attachments for plows for reducing damage to plowing equipment caused by obstacles on a  
surface being plowed and damage caused by plowing equipment to surfaces being plowed.

### **BACKGROUND**

A typical plow system, e.g. a snow plow system, includes a plow blade assembly and a  
10 mounting mechanism for attaching the plow to a vehicle. The mounting mechanism usually  
provides articulation of the plow relative to the vehicle. This articulation allows the plow blade  
to follow the contour of a surface being plowed. Additionally, the mounting mechanism includes  
hydraulic maneuvering controls for raising and lowering the plow blade, as well as for angling  
the plow blade relative to the axis of the vehicle. While the plow blade can be hydraulically  
15 raised and lowered, contact pressure between the plow blade and the surface being plowed is  
usually maintained by the weight of the plow blade or by a spring bias introduced in the  
mounting mechanism.

The plow blade assembly itself includes a mold board and a cutting edge. The mold  
board, making up the majority of the plow blade, is an upstanding, usually concave surface that  
20 causes plowed material, e.g. snow, to tumble forward and/or spill to the sides rather than  
rearward over the top of the blade. The cutting edge, or scraper, is located at the lower edge of  
the plow and separates the plowed material from the surface being plowed. In a snow plow, for

example, the cutting edge often provides a sharp edge to better remove packed snow and ice from paved surfaces.

Conventional plow systems work well for plowing smooth surfaces, such as pavement. These plow systems, however, are not well suited for plowing uneven pavement, surfaces that have projecting obstacles, or soft surfaces. Both uneven pavement and projecting obstacles can be damaging to the surface being plowed, the plow equipment and vehicle, and to the plow operator. Even at relatively slow speeds, when a plow blade encounters a protruding section of uneven pavement or an obstacle the plow blade may catch or hang up on the protrusion. The result of suddenly encountering and hanging up on a protrusion may be an abrupt, jarring impact. In the case of a largely immovable obstacle such as a sewer grate, the impact can be severe.

Similarly, conventional plow systems can be very damaging to soft surfaces such as gravel surfaces, grass, landscaping, sod, topsoil, etc. With the weight of the plow bearing down on the cutting edge, a plow may scrape away the soft surface down to the full vertical travel of the plow blade. Even if it is not itself being plowed, soft surfaces such as grass and landscaping adjacent to a desired plow path may be gouged and torn up by an errant plow. This is an especially common occurrence when the desired plow path is obscured by snow.

One mechanism that has been developed to mitigate the damage caused by uneven pavement or protruding obstacles is a cutting edge release. Release mechanisms generally place the cutting edge on a pivot oriented along the longitudinal axis of the cutting edge. When the cutting edge strikes an obstacle, the cutting edge has the ability to pivot backwards, away from the obstacle. Pivoting away from the obstacle may allow the cutting edge to "release" or free itself from the obstacle and ride over the obstacle.

During normal plowing, the drag placed on the cutting edge as it moves across the surface being plowed, as well as small obstacles on the surface, make it necessary to provide a strong spring bias resisting the pivot of the cutting edge in order to maintain the desired angle of attack of the cutting edge during normal plowing. Unfortunately, because this strong spring bias must be overcome to release the cutting edge moderate impacts will still be suffered by the plow equipment, vehicle, driver, and obstacles. These impacts, while ideally of a lesser magnitude, can still be damaging, especially after repeated occurrences. Also, depending on the available degree of pivot, the cutting edge may only be able to release obstacles that protrude only very slightly above the surface. Additionally, this mechanism does nothing to protect soft surfaces such as grass and landscaping.

A second design is directed at avoiding obstacles by creating a clearance between the bottom of the cutting edge of the plow and the surface being plowed. Shoes, typically in the form of discs, are attached to the bottom of the plow and ride in contact with the surface that is being plowed. The shoes, therefore, elevate the actual cutting edge above the surface. The height that the cutting edge is elevated off the surface can be adjusted by placing spacers, such as 1/8 inch washers, between the shoe and the mount on the bottom of the plow. Unfortunately, with this system as the clearance is increased the depth of unplowed material, e.g. snow, increases. If the clearance is not set high enough, however, the cutting edge will not clear obstacles, and will be ineffective.

Furthermore, because the shoes are positioned behind the cutting edge, the cutting edge will contact any obstacles before the shoe reaches the obstacle. Therefore, this design will not adapt to abrupt changes in surface grade. Also, soft surfaces, such as lawns, landscaping, or gravel paving are still susceptible to damage because the entire weight of the plow is

concentrated on two shoes that are usually not more than a few inches in diameter. On soft surfaces the shoes will tend to dig into the surface either creating ruts in the surface, or even lowering the cutting edge of the plow down onto the surface.

## SUMMARY

According to a first aspect, an attachment for a plow includes a member configured to be disposed between a cutting edge of the plow and a surface to be plowed. The member includes an exterior surface having a contacting region positioned for contacting a surface to be plowed and a forward region extending upward from said contacting region and forward of said contacting region such that the plow attachment may ride over protruding obstacles rather than hanging-up on the obstacles. In one exemplary embodiment consistent with the first aspect of the invention, the attachment may include a generally tubular member including a longitudinal opening adapted to receive at least a portion of the cutting edge of a plow, thereby providing the plow with an arcuate contact region.

According to a second aspect, a plow system comprises a plow having a cutting edge that is moveable between at least a first position and a second position, at least one actuator for moving the cutting edge between the first position and the second position, and a plow attachment including an exterior surface having a contacting region positioned for contacting a surface to be plowed and a forward region extending upward from said contacting region and forward of said contacting region. When the cutting edge is in the first position it is in a leading contact orientation with a surface being plowed. When the cutting edge is in the second position, the plow attachment is in a leading contact orientation with the surface being plowed. In the first position the cutting edge is available to provide a scraping action to surface being plowed. In the

second position the plow attachment may allow the plow to ride over protruding obstacles without hanging-up on the obstacles.

An exemplary embodiment consistent with the second aspect of the invention includes a plow having a cutting edge that is pivotable relative to the plow. A generally tubular, or partially tubular, plow attachment may be disposed on a rearward side of the cutting edge. Hydraulic actuators may be provided to pivot the cutting edge between a downward orientation that places the cutting edge in leading contact with the surface being plowed and a forward orientation that places the generally tubular plow attachment in leading contact with the surface being plowed.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Features and advantages of the present invention will be apparent from the following description of exemplary embodiments that are consistent with the present invention, which description should be understood in conjunction with the accompanying drawings, wherein:

FIG. 1 illustrates a front elevation of an exemplary attachment for a plow consistent with the present invention;

FIG. 2 is a cross-sectional view of the exemplary blade guard of the attachment illustrated in FIG. 1;

FIG. 3 is a cross-sectional view of a plow having mounted thereon an attachment consistent with the present invention;

FIG. 4 is a side elevation of an exemplary plow system consistent with a second aspect of the invention in a first position; and

FIG. 5 is a side elevation of the exemplary plow system of FIG. 4 in a second position.

## DETAILED DESCRIPTION

For simplicity and ease of explanation, the present invention will be described herein in connection with various exemplary embodiments described as being useful for plowing snow. A plow consistent with the present invention may, however, be used to plow any material that is movable by a plow. It is to be understood, therefore, that the embodiments described herein are presented by way of illustration, not of limitation.

While the sharp cutting edge of a plow may be useful for scraping ice from a surface or for removing hard packed snow, the sharp cutting edge of the plow is not always necessary. Additionally, the desire or ability to scrape a surface clear of snow, ice, or packed snow may be frustrated by obstacles protruding from the surface. According to one aspect, the present invention includes a plow attachment having a member that may be positioned between the cutting edge of a plow blade and a surface to be plowed. The member includes a forward region that transitions to a contact region, with the forward region being elevated above the contact region in order to allow the plow blade to ride over obstacles without hanging up on the obstacle. That is, when the plow blade encounters an obstacle the plow attachment may act in a similar manner to a cam follower and travel over the obstacle by at least partially lifting the plow blade off the surface being plowed. Even in the event that the plow attachment encounters a significant protruding obstacle, an impact of the plow hitting the obstacle may be reduced by the action of the plow riding over the obstacle. The ability to "ride over" obstacles allows the plow, via the attachment, to maintain contact with the surface being plowed, rather than being set at a height sufficient to clear obstacles. This allows better snow removal and also prevents damage to equipment, obstacles, lawns, landscaping, etc.

Referring to FIGS. 1-3 an exemplary plow attachment 10 consistent with a first aspect of the present invention is shown including a member 12, disposed in the general manner of a blade guard, and end caps 14, 16. As shown in FIG. 2, the member 12 may generally have a circular wall 18 including an opening 20 therein for receiving at least a portion of the cutting edge 22 of a plow blade, generally indicated at 24. The member 12 is configured to be disposed between the cutting edge 22 of the plow and the surface 23 to be plowed. An exterior surface of the member 12 includes a forward region 15 that extends forward of and upward from a contact region 17, which is positioned to engage the surface 23 to be plowed. In the illustrated embodiment the exterior surface of the member 12 surface includes a convex arcuate transition between the forward region 15 and the contact region 17. The member 12 may include holes 26 that may correspond to holes provided in the plow blade (not shown). The attachment 10 may be removeably secured to the plow blade 24 using a pin, bolt, etc. extending through the holes 26 in the attachment and the corresponding holes in the plow blade.

The end caps 14, 16 may each be hemispherical shells or even solid members. As shown, the end caps 14, 16 may be of the same general diameter as the member 12. While not shown, the end caps 14, 16 may also include an opening to allow the plow blade 24 to extend at least partially into the end caps 14, 16.

The exemplary plow attachment 10 described above may conveniently be produced from a section of pipe that is approximately the length of the plow blade. The opening 20 may be configured as a slot cut along the length of the section of pipe and sized to accommodate the width of the cutting edge of the plow blade, thereby allowing the pipe to be fitted on to the cutting edge of the plow blade. With the section of pipe in place on the plow blade a plurality of holes may be drilled through the section of pipe and through the plow blade. As mentioned

above, the plow attachment may be attached to the plow using pins, bolts, or the like extending through the holes in the attachment and the holes in the plow blade.

Consistent with the foregoing, the plow attachment may be fabricated from a lightweight plastic material. The light weight material may allow a single person to easily install the attachment on a plow. Alternatively, the attachment may be made from a metal, such as steel or aluminum that provides greater abrasion resistance and durability than plastic.

The use of pins or bolts for securing the plow attachment to the plow blade enables the plow attachment to be quickly and easily installed and removed from plow blade. This may allow the attachment to be used on an "as needed" basis. The attachment may be removed or installed between jobs, or even used for only a portion of a plowing job.

Additionally, because the attachment prevents the plow from digging up soft surfaces, the attachment may be used to remove snow from areas paved with gravel, stone, brick, etc. without disturbing the aggregate, pavers, brick, etc. Also, the attachment prevents damage to the surface of asphalt as well as textured or painted concrete. Similarly, it may even be possible to remove snow from lawns or any grass covered surface without damaging the grass.

Hereinabove, the attachment has been described in terms of a generally tubular structure which presents a rounded contact feature with the surface being plowed and a convex arcuate transition between the forward region and the contact region of the member. It should be understood that additional embodiments may include attachments having concave and/or non-circular arcuate members as well as angled and multi-angled surfaces. It will be understood by those having skill in the art that such additional and/or alternative configurations may also prevent a plow blade from hanging up on obstacles and/or allow the plow blade to ride over



obstacles. Furthermore such configurations may also reduce damage to surfaces such as grass, landscaping, etc.

According to another aspect, a plow system consistent with the invention includes a plow having a cutting edge and a plow attachment that may allow the plow to ride over protruding obstacles and/or soft surfaces. The plow may be positioned in at least a first position in which the cutting edge of the plow may scrape the surface being plowed and a second position in which the plow attachment may allow the plow to ride over protruding obstacles and/or soft surfaces.

In one exemplary embodiment, as shown in FIGS. 4-5, the plow system 40 may be provided to allow selectable use of either the cutting edge 42 of the plow 41 or a plow attachment 44 without requiring installation or removal of the attachment 44 each time. The plow attachment 44 may be positioned on a rearward side of the plow's cutting edge 42.

Consistent with the exemplary embodiment, the cutting edge 42 is pivotally connected to the plow 41, e.g., by pivot 46. The pivot 46 may be oriented to allow the cutting edge 42 of the plow to pivot forward and backward. The cutting edge 42 may be selectively pivotally positioned by actuator 48. The actuator 48 may be a hydraulic piston that may be powered by a hydraulic system for the plow. In the illustrated embodiment, the actuator 48 may operate through a linkage or bracket 50 to pivotally position the cutting edge 42. Alternative actuators and configurations thereof will be understood by those having skill in the art.

In a first position, illustrated in FIG. 4, the cutting edge 42 may be pivotally positioned such that the cutting edge 42 achieves a leading contact position relative to the plow attachment 44. In the exemplary embodiment, this position may be achieved by a retracted position of the hydraulic cylinder. In this first position, the cutting edge 42 may be placed in contact, or near contact, with a surface being plowed to scrape or skim the surface.

Referring to FIG. 5, the plow system 40 is shown in a second position. In the second position the cutting edge 42 is pivoted forward placing the plow attachment 44 in a leading contact position relative to the cutting edge 42. When a hydraulic cylinder is used to control the pivotal positioning of the cutting edge, the forward pivoted position may be achieved by extending the hydraulic piston. In this second position, the plow attachment 44 will contact any obstacles protruding from the surface a height less than  $h$ , which is the height of a forward region 45 of the plow attachment 44. The plow attachment 44 may allow the entire plow to ride up and over an obstacle without hanging up on the obstacle. Additionally, the second position of the plow system may be suitable for removing snow from a soft surface, such as gravel or dirt paved surface, grass, landscaping, etc.

The plow attachment 44 consistent with the second aspect of the invention may generally be an arcuate, angled, or multi-angled surface having a forward region 45 that extends forward of and upward from a contact region 47, which is positioned to engage the surface 43 to be plowed. When the plow attachment is caused to travel across a protruding obstacle the plow attachment, and the entire plow system, may ride over the obstacle rather than hanging up on the obstacle. According to one exemplary embodiment, the plow attachment may be round tube or portion of a round tube secured to a rearward surface of the cutting edge. The tube may be secured to the cutting edge by bolts, pins, welding, etc.

Consistent with an exemplary embodiment, a plow having a spring loaded release mechanism may be retrofitted to include the tubular, or partially tubular, attachment on a rearward surface of the cutting edge. The plow may be further modified to replace the springs with hydraulic cylinders extending between the respective spring mounts on the mold board and the cutting edge. As discussed above, extending the hydraulic pistons may cause the cutting

edge to pivot forward, while retracting the hydraulic cylinders may cause the cutting edge to pivot rearward. The hydraulic power for the hydraulic cylinders used to pivot the cutting edge may be provided by a plow hydraulic system used to raise, lower, and angle the plow. It may, therefore, be possible for a plow operator to select between the use of the cutting edge and the  
5 plow attachment from the cabin of the plow vehicle.

In an alternative embodiment consistent with the second aspect of the invention, the attachment may be disposed on a forward surface of the cutting edge. In this configuration the attachment may be brought into leading contact with the surface being plowed by pivoting the cutting edge rearward. Accordingly, when the cutting edge is oriented downward or forward the  
10 cutting edge may scrape the surface being plowed. However, when the cutting edge is oriented rearward the plow system contacts the surface through the attachment that may allow the plow system to ride over obstacles or soft surfaces.

It should be understood that the various aspects and embodiments of the invention disclosed herein are intended only to be illustrative and not limiting. It should be understood that  
15 the various aspects and embodiments may be modified and combined without departing from the spirit and scope of the invention as defined by the appended claims.